

Have Business Cycles Become More Synchronous After NAFTA?

American Business Review
May 2021, Vol.24(1) 54 - 66
© The Authors 2021, [CC BY-NC](#)
ISSN: 2689-8810 (Online)
ISSN: 0743-2348 (Print)

Puneet Vatsa^a

<https://doi.org/10.37625/abr.24.1.54-66>

ABSTRACT

Trade agreements do not necessitate business cycle comovement. Focusing on NAFTA, we investigate whether business cycles in Canada, Mexico, and the US have become more synchronous after the landmark trade agreement came into effect in 1994. To this end, using the newly-developed Hamilton filter, we decompose the real GDPs of the three countries to derive their business cycle components; then, we conduct time-difference analyses, which illuminate correlations at different time intervals, to study business cycle synchronization. We find that business cycles in Mexico and the US have become positively correlated after NAFTA—they were weakly and negatively correlated during the pre-NAFTA period. Contrastingly, correlations amongst the US and Canadian business cycles have weakened during the post-NAFTA period; nevertheless, these two countries' business cycles continue to be tightly and positively correlated. The oft-used Hodrick-Prescott filter is utilized to confirm the robustness of the results—the two filters lead to similar conclusions.

KEYWORDS

NAFTA, Business Cycles, Hamilton Filter, Hodrick-Prescott Filter

JEL Codes: C32, E32, F13, F15

INTRODUCTION

The North American Free Trade Agreement, NAFTA, came into effect on January 1, 1994. It was a landmark agreement between Canada, Mexico, and the US, designed to bolster trade between the three countries. While the Canada-United States Free Trade Agreement, CUSFTA, was already in place, NAFTA allied these decidedly affluent economies with a veritable developing economy, Mexico. The proponents of NAFTA argued that the treaty would usher in a period of growth and development for Mexico at little, if any, cost to its OECD counterparts, whereas its opponents warned of a 'giant sucking sound' made by the exodus of manufacturing jobs from the US to Mexico.

To be sure, trade alliances affect the socio-economic tapestry of the nations involved; moreover, they have environmental, political, and cultural implications. Nevertheless, their first-order effects are on the trade itself—with the progressive elimination of trade barriers within trading blocs, trade grows on the back of such alliances. However, lower trade barriers do not automatically or always confer business cycle comovement. Thus, it is unsurprising that despite the considerable attention that NAFTA has drawn from academics, politicians, industry stakeholders, and the media, it is unclear whether business cycle coherence amongst Canada, Mexico, and the US has increased after the landmark agreement came into effect in 1994; moreover, the empirical findings are also mixed.

^a Lincoln University, Christchurch, New Zealand

Corresponding Author:

Vatsa (Puneet.Vatsa@lincoln.ac.nz)

Considering the ongoing disagreements regarding NAFTA's effects on business cycle synchronization amongst the three member-nations, the present paper is devoted to answering the following questions: Did business cycles in Canada and Mexico become more synchronized with those in the US after NAFTA came into effect? Did the business cycles become less volatile during the post-NAFTA period? Do business cycles in the US lead those in Canada and Mexico? If yes, what is the duration with which the Canadian and Mexican economies lag the US economy? We use recent advances in time-series econometrics and time-difference analysis to answer these questions.

Although it is tempting to surmise a greater degree of comovement amongst economies once they form trade alliances, this is by no means inevitable. Trade theory itself points to different potential outcomes. On the one hand, lower trade barriers may engender specialization in producing certain goods and services. In turn, business cycles may become asynchronous. On the other hand, with the growth in intra-industry trade between countries, exposure to common shocks, or both, the countries' business cycles may synchronize (Frankel & Rose, 1998).

Be that as it may, trade barriers are not unsurmountable impediments that stand in the way of business cycle synchronization. It is plausible that business cycles across countries may synchronize in response to a global business cycle, notwithstanding trade barriers (Gregory, Head, & Raynauld, 1997). Although, in such cases, business cycles may be immune to policy interventions.

Then, there is the issue of endogeneity. Granted that stronger trade ties may engender correlated business cycles; however, tightly correlated business cycles may also foster stronger trade ties. Furthermore, countries between which trade-flows are significant are more likely to form trading alliances. After all, they stand to gain more from eliminating trade barriers. Evidently, trade intensity and business cycle correlations are endogenous (Frankel & Rose, 1998).

While this endogeneity does not make the task of analyzing cause-and-effect any more straightforward, it may motivate one to reason that the degree to which countries' business cycles co-move is positively correlated with the volume of trade between them. And there is ample evidence that supports this reasoning (see, for example, Frankel & Rose, 1998; Anderson, Kwark, & Vahid, 1999; Kose & Yi, 2006; and Calderón, Chong, & Stein, 2007).

In the context of the NAFTA trading bloc, two points bear emphasis: one, the US accounts for close to 90 percent of the combined real GDP of the three countries; two, it is the recipient of more than 75% of Mexico's and Canada's exports. Thus, it stands to reason that the US is the engine that drives the NAFTA economy, and that the success of the Canadian and Mexican economies, or at the very least their exports sectors, is tethered to state of the US economy (see, for example, Blecker, 2003).

While research and commentary devoted to NAFTA and its implications abound, a consensus on its effects continues to be elusive. Considering that the US was the destination for significant proportions of the exports of both Canada and Mexico even before NAFTA came into effect, the agreement, after all, may not have been a watershed moment apropos trade intensity and business cycle correlations amongst the three countries. Acosta and Ponce (2008) argue that NAFTA did not trigger economic integration within the bloc. Rather, it strengthened the process that was already underway. To be clear, they tested for a strong form of co-dependence amongst the real GDPs of the three countries, and did not address potential lead-lag associations amongst them. On the other hand, Bejan (2011) points out that, while the business cycles in the US and Mexico were negatively associated before 1992, the association switched to a positive one after NAFTA—the ratification of NAFTA was a defining moment for trade between the two countries (Hernandez-Trillo, 2018). De Pace (2013) also notes increased coherence amongst the business cycles of Mexico and the US post-NAFTA, but suggests that NAFTA did not affect the associations between the US and Canadian business cycles. However, Owyang, Piger, and Soques (2019) contend that business cycle propagation across the three countries has increased due to trade liberalization. Interestingly, Aysun and Yagihashi (2019) find stronger similarities between the US and the Trans-Pacific countries than between the US and its NAFTA

neighbors; Bakas, Jackson, and Magkonis (2019) conclude that the linkages of the US economy with the Canadian economy are deeper than its linkages with the Mexican economy. Clearly, the findings and conclusions of these analyses are notably different.

Regardless of these differences, which pertain to business cycle coherence between Mexico and the US, there is general agreement about the direction and even the strength of the correlations amongst the business cycles in Canada and the US (Engle & Kozicki, 1993; Gregory et al., 1997); however, the impact of NAFTA on these correlations is less clear. It is plausible that NAFTA, which superseded CUSFTA, may have strengthened ties between the US and Mexico at the expense of those between Canada and the US. Moreover, none of the above papers analyze the lead-lag associations between the business cycles.

The adequacies of different theories, many of which are decidedly competing, are judged by how well they explain empirical observations. Thus, it is necessary first to establish the empirical benchmarks, which theories of international business cycles should account for and be able to explain. All things considered, the principal contributions of the paper are these: it provides up-to-date empirical evidence on business cycle synchronization amongst Canada, Mexico, and the US; by comparing the said synchronization between the pre- and post-NAFTA periods, it informs the ongoing debate regarding the effects of the landmark trade agreement on economic integration amongst the three member nations and presents stylized facts behind which researchers, commentators, and analysts can align. From a methodologic viewpoint, it is the first paper to illuminate the lead-lag associations amongst the three business cycles using time-difference analysis; it is also the first paper to use the Hamilton filter to decompose the real GDPs of the three countries to isolate their business cycles. Next, we turn our attention to the methodological framework used in the study.

METHODS

In a recent paper, Hamilton (2018) has proposed a regression-based decomposition framework using which one can isolate the cyclical components of non-stationary time-series (Balashova & Serletis, 2020; Jahan & Serletis, 2019). Fundamental to his method is reconsidering the length of the forecast-horizon. Noting that finite time-series do not lend themselves well to long-horizon forecasts, Hamilton (2018) suggests a two-year horizon for the analyses of business cycles.

A two-year ahead forecast for y_t that relies on the recent p values is denoted by y_{t+h} , where h is the number of periods in two years, and both h and p are integer multiples of the number of periods in one year. So, for annual data, 2 and 1 represent values for h and p , respectively. Formally, this is represented as

$$y_{t+2} = \alpha_0 + \alpha_1 y_t + v_{t+2} \quad (1)$$

which, upon adjusting the time-periods, can be re-written as

$$y_t = \alpha_0 + \alpha_1 y_{t-3} + v_t \quad (2)$$

The residuals from (2),

$$\hat{v}_t = y_t - (\hat{\alpha}_0 + \hat{\alpha}_1 y_{t-3}) \quad (3)$$

yield the cyclical component.

This regression is straightforward to implement and given its autoregressive nature, no other variables are needed to derive the cyclical component from the observed time-series. The intuition is this: in any forecasting endeavor, gaps between outcomes and expectations are to be expected. In the context of the real GDP, these gaps may arise due to unexpectedly severe financial crises, political instability, outbreak of pandemics, or surprisingly steep economic expansions. These gaps define the business cycles.

Hamilton (2018) presents this method as a better alternative to the well-known Hodrick-Prescott filter (Hodrick & Prescott, 1981). He contends that the Hodrick-Prescott filter generates spurious dynamics and yields filtered values that are markedly different at the end of the sample than they are in its middle. Furthermore, the commonly used values for the smoothing parameter are arbitrary; more consequentially, they are inappropriate. These drawbacks have significant implications.

Theories and explanations predicated on spurious results can lead to incorrect conclusions. Since the Hodrick-Prescott filter has been used widely, including in some of the analyses noted above (Bejan, 2011; Gregory et al., 1997), it is instructive to revisit prior results and compute cycles using alternate measures. However, recognizing that the Hamilton filter is not without its critics and also suffers from drawbacks (Drehmann & Yetman, 2018; Schöler, 2018), and the inexactitude and uncertainty inherent in statistical techniques, we derive cycles using both the Hamilton and Hodrick-Prescott filters. Applying the two methods allows us to check the robustness of the results and triangulate a well-informed perspective.

Although the Hodrick-Prescott filter is a well-known technique, a brief description of this method is in order. This filter yields a smooth trend component g_t of a time-series y_t by optimizing equation (4):

$$\min_{g_t} \{ \sum_{t=1}^T (y_t - g_t)^2 + \lambda \sum_{t=2}^{T-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2 \} \quad (4)$$

The choice of the smoothing parameter λ is critical to the shape of the trends and cycles. A higher value yields a smoother trend. In fact, as $\lambda \rightarrow \infty$, the series g_t approaches a linear trend, whereas setting $\lambda = 0$ yields g_t that exactly resembles y_t . The cyclical component is the vertical distance between y_t and g_t . In keeping with the universally accepted rule of thumb, and given the annual frequency of the data, we set $\lambda = 100$.

We de-trend 100 times the natural logarithmic transformation of each time-series using the two filters and estimate the cross-correlations amongst the resulting cyclical components (see, for example, He et al., 2013; Fiorito & Kollintaz, 1994; and Serletis & Kemp, 1998). Specifically, we estimate $\rho(i)$, where $i \in (0, \pm 1, 2, 3, 4)$, between CA_t^i and MX_t^i , the business cycles—shifted i periods—of Canada and Mexico, vis-a-vis the US business cycle, US_t^i . Thereafter, we examine the sizes and signs of the cross-correlations, $\rho(i)$. If the maximum value of $|\rho(i)|$ corresponds to $i > 0$ ($i < 0$), then the business cycles in Canada and Mexico are said to lag (lead) the US business cycles, whereas their business cycles are said to be contemporaneously associated with the US business cycle if the maximum value of $|\rho(i)|$ occurs at $i = 0$, and $|\rho(i)| > 0.2$.

To determine the strength of the associations between the business cycles, we follow the thresholds used by Fiorito and Kollintzas (1994). As such, if $|\rho(0)| < 0.2$, the business cycles in Canada and Mexico are said to be contemporaneously uncorrelated with the US business cycle. $0.2 < |\rho(0)| < 0.5$ indicates weak contemporaneous correlation, whereas $0.5 < |\rho(0)| < 1$ indicates that the business cycles are strongly correlated. Furthermore, the sign of $\rho(0)$ reveals the directional association between the business cycles: if $\rho(0) > 0.2$, the business cycles are said to exhibit positive comovement, whereas if $\rho(0) < -0.2$, they are deemed to be inversely related.

DATA

We analyze the annual real GDP of Canada, Mexico, and the US for the period 1970-2019. The data are denominated in 2010 US dollars and obtained from the World Bank's website, <https://data.worldbank.org/> (WITS, 2020).

A brief discussion of the data makes a good starting point. Figure 1 shows the log-transformed real GDPs of the three countries. In each of the three cases, clear upward trends are evident; however, they are punctuated by plateaus and dips at irregular intervals. The Global Financial Crisis between 2007 and 2009 stands out in that the real GDPs declined in each of the three countries during this period. However, in general, Mexico exhibits distinct patterns—considering that it is only developing country amongst the three, this is unsurprising.

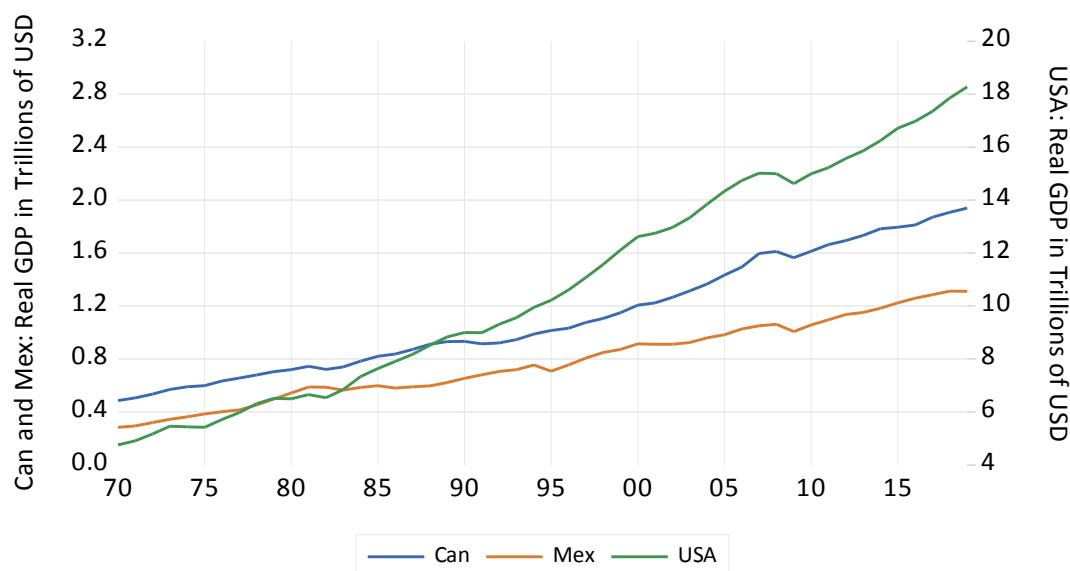


Figure 1. Real GDP of Canada, Mexico, and the US

Mexico's real GDP increased rapidly during the late 1970s. This rise constitutes the most prominent expansionary phase experienced by any of the three countries over the entire 50 years since 1970. Somewhat ironically, in the latter half of the 1970s, Mexico was also grappling with rising budget deficits and the devaluation of the Peso, which occurred in 1976. However, discovering oil reserves in 1978, a year marked by rising oil prices due to unrest in the middle-east, provided a much-needed boost to the Mexican economy. Be that as it may, during the 1980s, rising interest rates, high foreign indebtedness, falling oil prices, and a recession in the US stifled the Mexican economy. Consequently, it slipped into a recession and languished for the best part of the 1980s. Since then, the Mexican economy has grown steadily and appears to move in tandem with its North American counterparts.

EMPIRICAL EVIDENCE

The decidedly upward trends are the most salient features of the three time-series. However, the prominence of these trends makes it difficult to discern cyclical features from the observed data. Thus, to unveil and examine business cycles, which are stationary sub-components of the real GDP, we use

the Hamilton and Hodrick-Prescott filters described above. Given that these filters are designed to recover cycles from non-stationary data, examining the data's stationary properties is in order; to this end, we conduct unit-root tests.

Table 1. Unit Root Tests

	Can	Mex	USA
Level	-2.61	-2.65	-1.25
First Difference	-5.31*	-5.59*	-5.10*

Phillips-Perron tests are reported; the lag-length is determined by using the Schwert (1989)

$$\text{formula: } \text{Int} \left\{ 4 \left(\left(\frac{T}{100} \right)^{0.25} \right) \right\}$$

The results presented in Table 1 suggest that the three time-series are non-stationary. To be clear, given the clear trends in the data, we include both an intercept and a linear time-trend in unit-root regressions. We recognize that including more deterministic regressors reduces the power of the test. However, not accounting for time-trends, especially when they are obvious in the data, may reduce the power of the unit-root tests to zero. In each of the three cases, the level forms are non-stationary, whereas the first-differences are stationary. Thus, we conclude that the real GDP series of integrated of order 1.

When data are integrated of order 1, differencing the data once should remove its predictable aspects. Despite this, the Hodrick-Prescott filter differences the data three more times. This produces cycles that are just artifacts of the filter itself, with no underpinnings in the underlying data-generating (Hamilton, 2018). However, studies have shown that both filters can produce directionally similar results, as long as the data do not have a strong seasonal component (Vatsa, 2020). Given the annual frequency of the data used in the present paper, seasonality is not a concern.

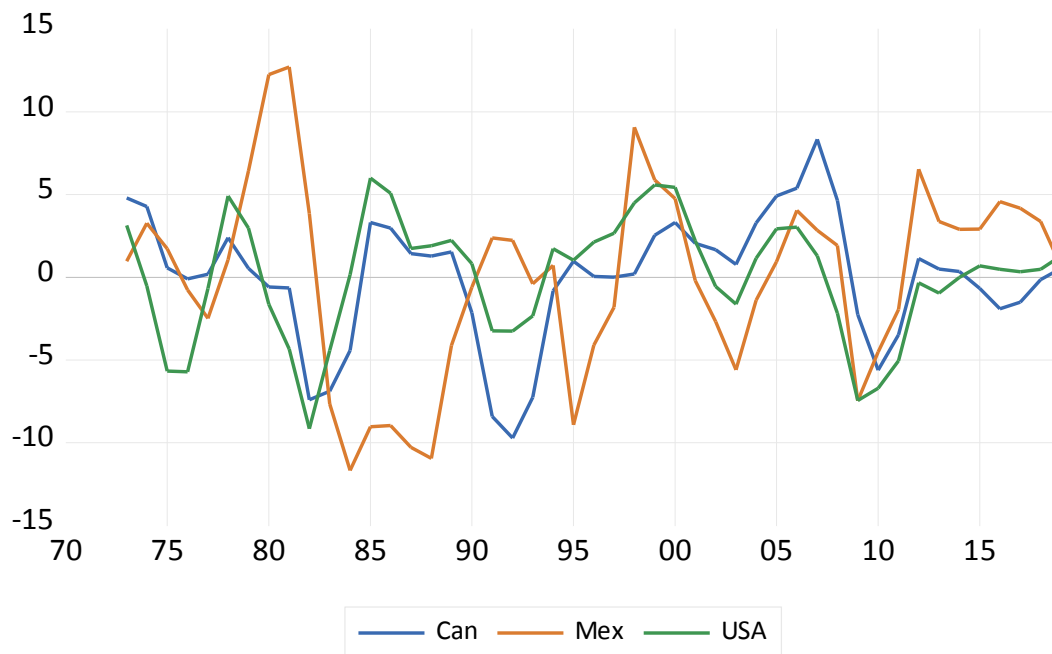


Figure 2. Cycles Derived from The Hamilton Filter

In Figure 2, we plot the cycles derived from the Hamilton filter. The key findings are these: there is strong comovement amongst the Canadian and the US business cycles, whereas business cycles in Mexico appear to behave rather distinctly, especially between 1970 and 1993; after 1993, the business cycles in Mexico appear to co-move with those in Canada and the US; and business cycles in Mexico are more volatile, with higher peaks and lower troughs.

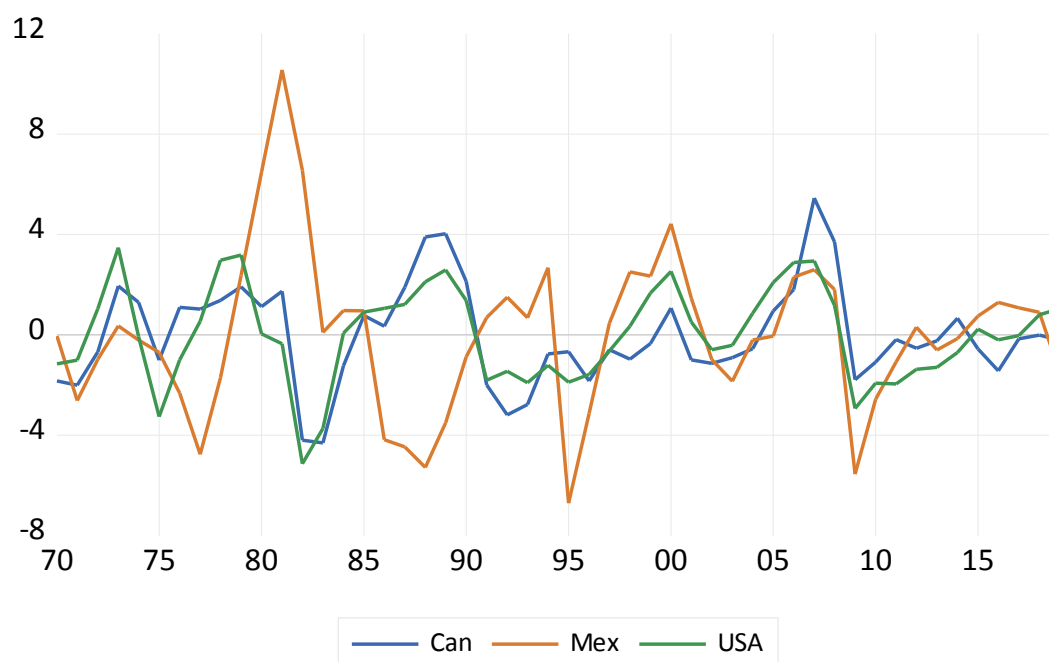


Figure 3. Cycles Derived from The Hodrick-Prescott Filter

The cycles derived from the Hodrick-Prescott filter are illustrated in Figure 3. These cycles yield similar insights to those gleaned from Figure 2. Specifically, while the business cycles in the US and Canada co-move for the entire sample period, those in Mexico behave differently from the business cycles in the other two countries before 1993, but similarly after 1993. The correlations between the cycles derived from the Hamilton and Hodrick-Prescott filters for Canada, Mexico, and the US are 0.72, 0.75, and 0.77, respectively.

Figures 2 and 3 show that the ratification of NAFTA coincides with a noteworthy change in the degree to which the three countries' business cycles co-move; this is especially true for the comovement between the Mexican business cycles on the one hand, and the US and Canadian business cycles on the other. In light of these visual observations, we examine the cross-correlations amongst the business cycles in the three countries for three different time-periods. Specifically, we consider the entire 50-year period between 1970 and 2019, the period between 1970 and 1993, i.e., the pre-NAFTA period, and the period after 1993, i.e., the post-NAFTA period. Did business cycle interlinkages change after the NAFTA came into effect? To answer this question, let us examine the evidence presented in Table 2.

Table 2. Correlations Amongst Cyclical Components

	$i = -4$	$i = -3$	$i = -2$	$i = -1$	$i = 0$	$i = 1$	$i = 2$	$i = 3$	$i = 4$
Panel A: 1970-2019									
Can	-0.40	-0.43	-0.20	0.25	0.67	0.62	0.32	-0.05	-0.24
Mex	-0.03	-0.31	-0.44	-0.34	-0.02	0.14	0.18	0.09	0.08
Panel B: 1970-1993; Pre-NAFTA									
Can	-0.31	-0.43	-0.12	0.38	0.80	0.66	0.24	-0.28	-0.57
Mex	0.21	-0.29	-0.76	-0.81	-0.44	0.01	0.32	0.41	0.44
Panel C: 1994-2019; Post-NAFTA									
Can	-0.48	-0.46	-0.30	0.08	0.58	0.64	0.41	0.12	0.02
Mex	-0.41	-0.40	-0.03	0.31	0.56	0.29	-0.06	-0.47	-0.51
Panel D: 1970-2019									
Can	-0.32	-0.30	-0.15	0.30	0.79	0.61	0.26	-0.09	-0.33
Mex	0.07	-0.21	-0.41	-0.35	0.02	0.17	0.19	0.14	0.10
Panel E: 1970-1993; Pre-NAFTA									
Can	-0.30	-0.34	-0.14	0.36	0.85	0.61	0.22	-0.18	-0.46
Mex	0.26	-0.19	-0.66	-0.76	-0.39	0.01	0.31	0.40	0.38
Panel F: 1994-2019; Post-NAFTA									
Can	-0.33	-0.26	-0.16	0.22	0.69	0.61	0.32	0.06	-0.12
Mex	-0.29	-0.25	0.03	0.39	0.74	0.47	-0.08	-0.53	-0.59

Note: Panels A, B, and C (D, E, and F) comprise correlations derived from the Hamilton filter (Hodrick-Prescott filter)

The cross-correlations presented in Table 2 confirm the visual observations discussed above. Panel A comprises the correlations derived using the Hamilton filter for the entire sample period, 1970-2019. First, consider the contemporaneous correlations, which are presented in the column labelled $i = 0$. The results show that the business cycles in Canada and the US are strongly and positively correlated: the contemporaneous correlation between the two is 0.67. On the other hand, business cycles in Mexico are uncorrelated with those in the US. Interestingly, the correlation amongst the US and Canadian business cycles is 0.80 for the pre-NAFTA period (see row 1 of Panel B) relative to 0.58 for the post-NAFTA period (see row 1 of Panel C)—the correlation between the business cycles of the two countries weakened after NAFTA was instated.

On the other hand, the Mexican business cycles were weakly and negatively correlated with the US business cycle during the pre-NAFTA period. The correlations corresponding to $i = 0$ presented in the second rows of Panels B (i.e., -0.44) and E (i.e., -0.39) signify a weak negative association between the business cycles in the two countries during the pre-NAFTA period, whereas those in the second rows of Panels C (i.e., 0.56) and F (i.e., 0.74) point to a strong positive association between the business cycles of the two countries after NAFTA.

High levels of foreign debt and macro-financial crises in Mexico during the 1980s, as well as the relatively low volume of cross-border trade with the US, explain the lack of business cycles comovement during the pre-NAFTA period; be that as it may, the two countries' business cycles became strongly and positively correlated after the inception of NAFTA. These findings are consistent with Sosa (2008), who notes that macroeconomic and financial reforms implemented in Mexico along with greater trade integration with the US increased the significance of shocks originating in the latter on Mexican growth during the post-NAFTA period. Furthermore, the US's financial assistance to implement stabilization policies and reform programs helped Mexico avert a prolonged crisis in 1994-95 (Kose, Meredith, & Towe, 2004). The absence of such support before NAFTA contributed to protracted periods of economic stagnation and crises in Mexico during the 1980s (USTR, 1997); this impeded business cycle coherence between them.

Next, consider the lead-lag associations between the three business cycles. The US and Canadian business cycles are strongly contemporaneously correlated for the entire sample period. However, during the post-NAFTA period, there is evidence that Canada's business cycles lag the US business cycles by one year: the maximum value of $|\rho(i)|$, i.e., 0.64, occurs at $i = 1$ (see row 1 of Panel C). The Hodrick-Prescott filter suggests that the two countries' business cycles move contemporaneously regardless of the sample period: the maximum values of $|\rho(i)|$ occur at $i = 0$.

The links between Mexico's business cycles and those of the US vary notably across the pre- and post-NAFTA periods. During the pre-NAFTA period, expansionary phases in Mexico led contractionary phases in the US by one year—the maximum values of $|\rho(i)|$ occur at $i = -1$ in the second rows of Panels B and E. However, during the post-NAFTA period, business cycles in Mexico co-move with the US business cycles. It is interesting that the associations of the US business cycles with those in Mexico strengthened markedly after the enactment of NAFTA, whereas their associations with the Canadian business cycles somewhat weakened.

Table 3. Business Cycle Volatility

	Can		Mex		USA	
	Hamilton	HP	Hamilton	HP	Hamilton	HP
Pre-NAFTA	4.42	2.34	7.01	3.76	7.01	2.21
Post-NAFTA	2.94	1.61	4.45	2.53	4.45	1.6

Note: Standard deviations associated with the Hamilton filter (Hodrick-Prescott filter) are presented in columns labelled Hamilton (HP)

Nevertheless, as shown in Table 3, the business cycles in each of the three countries became less volatile during post-NAFTA period. Also, from an econometric standpoint, the Hamilton filter produces cycles with more variability.

CONCLUSION AND POLICY IMPLICATIONS

Recognizing the importance of establishing stylized facts that different theories of international business cycles should be able to explain and commentators can align behind, we analyze the associations amongst the business cycles in Canada, Mexico, and the US during the pre- and post-NAFTA periods. To this end, we utilize a new time-series filter developed by Hamilton (2018) and the well-established Hodrick-Prescott filter to derive the business cycles in the three countries; then, we conduct time-difference analysis to illuminate their business cycle coherence.

The key results are these. First, while the business cycles in Mexico and the US exhibit synchronous dynamics during the post-NAFTA period, they were weakly and negatively correlated before NAFTA was ratified in 1993—in this regard, NAFTA was indeed a defining moment, a veritable inflection point.

Second, the business cycles in the US and Canada have been congruous since 1970. Third, the correlations between these two countries' business cycles weakened during the post-NAFTA relative to the pre-NAFTA period. Fourth, there is evidence that the Canadian business cycles lag behind the US business cycles during the post-NAFTA period—to be clear, the evidence is mixed. Fifth, business cycle volatility in each of the three countries declined after NAFTA. Sixth, the results remain robust to applying different filters; the consistency across the two methods corroborates the empirical evidence provided in this paper.

These results have important policy implications. They point to a strong role of trade liberalization and integration in business cycle synchronization between Mexico and the US. However, business cycle coherence may propagate shocks originating in the large dominant economies to the smaller, less advanced trading partners—economic and financial crises beginning in the US may stifle growth in Mexico; the global financial crisis in 2007-2008 is a case in point. Thus, policymakers should be mindful of the potential for importing recessions and glacial economic growth from significant trading partners. Considering the weak economic performance of the US since the 2007-2008 global financial crisis, it is prudent for Mexico to continue its efforts to diversify trade. Furthermore, the contemporaneous comovement between the US and Mexican business cycles underscores the importance of a policy framework that proactively incorporates forecasts of socio-economic and political developments in trading partners for devising suitable policies.

Nevertheless, forging trade agreements does not automatically confer greater business cycle coherence. After all, the correlations between the US and Canadian business cycles declined after NAFTA. The results show that the expansion of trading blocs, and the accompanying recalibration of cross-country trade volumes, can reduce the strength of business cycle associations between different countries, especially if they are tightly integrated even in the absence of trade agreements. Policymakers should heed these possibilities when devising and negotiating trade agreements. Also, noting that the Canadian business cycles lag those in the US, policymakers should proactively design macroeconomic policies to stabilize the Canadian economy and shield it from adverse outcomes based on their observations on the US economy. The results show that trade alliances may also prove effective in reducing business cycle volatility: trade agreements may temper economic instability.

This paper presents empirical evidence on business cycle dynamics and correlations. However, we are also mindful of the importance of explaining this evidence formally. Hence, in future research endeavors, we intend to interpret the findings presented above using analytical frameworks comprising a wide array of macroeconomic variables. Specifically, we intend to answer this question: What are the causal pathways and transmission mechanisms that lead to this evidence?

REFERENCES

- Acosta, R. J., & Ponce, R. A. (2008). Economic integration in North America. *Applied Econometrics and International Development*, 8(2).
- Anderson, H. M., Kwark, N. S., & Vahid, F. (1999). Does international trade synchronize business cycles? Monash Econometrics and Business Statistics Working Papers 8/99, Monash University, Department of Econometrics and Business Statistics.
- Aysun, U., & Yagihashi, T. (2019). The common sources of business cycles in Trans-Pacific countries and the US? A comparison with NAFTA. *World Economy*, 42(4), 1077-1109.
- Bakas, D., Jackson, K., & Magkonis, G. (2019). Trade (Dis)integration: The Sudden Death of NAFTA. *Open Economies Review*, 31(4), 931-943.
- Balashova, S., & Serletis, A. (2020). Oil prices shocks and the Russian economy. *Journal of Economic Asymmetries*, 21, E00148.
- Bejan, M. (2011). Trade agreements and international comovements: The case of NAFTA (North American Free Trade Agreement). *Review of Economic Dynamics*, 14(4), 667-685.
- Blecker, R. A. (2003). The North American Economies After NAFTA: A Critical Appraisal. *International Journal of Political Economy*, 33(3), 5-27.
- Calderón, C., Chong, A., & Stein, E. (2007). Trade intensity and business cycle synchronization: Are developing countries any different? *Journal of International Economics*, 71(1), 2-21.
- De Pace, P. (2013). Currency union, free-trade areas, and business cycle synchronization. *Macroeconomic Dynamics*, 17(3), 646-680.
- Drehmann, M., & Yetman, J. (2018). Why you should use the Hodrick-Prescott filter - at least to generate credit gaps. BIS Working Papers, No 744, 17 September 2018.
- Engle, R., and Kozicki, S. (1993). Testing for Common Features. *Journal of business & economic statistics*, Vol.11 (4), p.369-380.
- Fiorito, R., & Kollintzas, T., 1994. Stylized facts of business cycles in the G7 from a real business cycles perspective. *European Economic Review*, 38(2), 235-269.
- Frankel, J. A., & Rose, A. K. (1998). The Endogeneity of the Optimum Currency Area Criteria. *The Economic Journal (London)*, 108(449), 1009-1025.
- Gregory, A. W., Head, A. C., & Raynauld, J. (1997). Measuring World Business Cycles. *International Economic Review (Philadelphia)*, 38(3), 677-701.
- Hamilton, J. D. (2018). Why you should never use the Hodrick-Prescott filter. *Review of Economics and Statistics*, 100(5), 831-43.
- He, Y., Wang, B., Wang, J., Xiong, W., & Xia, T. (2013). Correlation between Chinese and international energy prices based on a HP filter and time difference analysis. *Energy Policy*, 62, 898-909.
- Hernandez-Trillo, F. (2018). Mexico, NAFTA, and beyond. *The International Trade Journal*, 32(1), 5-20.
- Hodrick, R. J., & Prescott, E. C. (1981). Postwar U.S. business cycles: an empirical investigation. Discussion Paper No. 451, Carnegie-Mellon University.
- Jahan, S., & Serletis, A. (2019). Business cycles and hydrocarbon gas liquids prices. *The Journal of Economic Asymmetries* 19, E00115.
- Kose, A. and Yi, K-M. (2006). Can the standard international business cycle model explain the relation between trade and comovement? *Journal of international economics*, Vol.68 (2), p.267-295.
- Kose, A., Towe, C. M., & Meredith, G. M. (2004). How Has Nafta Affected the Mexican Economy? Review and Evidence. IMF Working Paper, 4(59), 1.
- Owyang, M. T., Piger, J. M., & Soques, D. (2019). Contagious Switching. Federal Reserve Bank of St. Louis, Working Paper 2019-014B, <https://doi.org/10.20955/wp.2019.014>.
- Schüler, Y. (2018). On the cyclical properties of Hamilton's regression filter. Discussion Paper, Deutsche Bundesbank No 03/2018.

- Schwert, G. W. (1989). Tests for Unit Roots: A Monte Carlo Investigation. *Journal of Business and Economic Statistics*, 7(2), 147.
- Serletis, A., & Kemp, T. (1998). The cyclical behavior of monthly NYMEX energy prices. *Energy Economics*, 20(3), 265-71.
- Sosa, S. (2008). External Shocks and Business Cycle Fluctuations in Mexico: How Important are U.S. Factors? IMF Working Paper, WP/08/100.
- USTR (Office of the United States Trade Representative). (1997). Study on the Operation and Effect of the North American Free Trade Agreement. Office of the United States Trade Representative.
- Vatsa, P. (2020). Seasonality and cycles in tourism demand—redux. *Annals of Tourism Research*, <https://doi.org/10.1016/j.annals.2020.103105>.
- WITS (2020). <https://wits.worldbank.org/> Retrieved on Oct 13, 2020.